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FIGURE 4-4: MAP OF PROPOSED SAMPLING LOCATIONS, PARTIALLY SCANNED

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Rev. 07/10/02

EPA Contract No. 68-W8-0093
Work Assignment No. 17-5L4J
Donohue Project No. 20026.001

VOLUME 2

ADDENDUM I
FIELD SAMPLING PLAN

HIMCO DUMP
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PHASE II
ELKHART, INDIANA

JULY 1991

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
230 South Dearborn Street
Chicago, Illinois 60604

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1.0 SITE BACKGROUND AND HISTORY

1.1 INTRODUCTION

The purpose of this Field Sampling Plan (FSP) addendum is to describe field tasks included in Phase II activities. Phase II tasks are: a private well inventory, surface water and sediment sampling, surface and subsurface soil sampling, trenching to collect leachate, trenching to delineate debris, installation of one monitoring well, and soil sampling of the landfill cap for additional geotechnical analysis. All samples to be collected are summarized in Table 4-9. Table 4-10 provides a summary of sample bottles and preservatives. Table 4-11 provides the sample numbering and trench numbering system and activity rationale. Proposed sampling locations are shown in Figure 4-4.

Field team organization and responsibilities, sample identification numbers, chain-of-custody, and sample packaging and shipping procedures are as described in Sections 3.0, 5.0, 6.0, and 7.0, respectively, of the previously approved Himco Dump RI/FS FSP (Donohue, 1990).

2.0 FIELD INVESTIGATION OBJECTIVES AND APPROACH

The field investigation objectives and approach are described in Section 2.0 of the previously approved Himco Dump RI/FS FSP (Donohue, 1990).

3.0 FIELD TEAM ORGANIZATION AND RESPONSIBILITIES

The field team organization and responsibilities are described in Section 3.0 of the previously approved Himco Dump RI/FS FSP (Donohue, 1990).

4.0 PRIVATE WELL INVENTORY AND MEDIA SPECIFIC SAMPLING PLANS

The following sections 4.11 through 4.16 present information specific to Phase II field activities.

Phase II tasks are: a private well inventory, surface water and sediment sampling, surface and subsurface soil sampling, trenching to collect leachate and to delineate debris, installation of one monitoring well, and soil sampling of the landfill cap for additional geotechnical analysis. All samples to be collected are summarized in Table 4-9. Table 4-10 provides a summary of sample bottles and preservatives. Table 4-11 provides the sample numbering and trench numbering system and sampling rationale. Proposed sampling locations are shown in Figure 4-4.

4.11 PRIVATE WELL INVENTORY

4.11.1 Introduction

Approximately five residences east and approximately five residences or light industries southeast of the site will be inventoried to gain hydrogeologic information to be used in evaluating remedial design alternatives for groundwater. The inventory will consist of telephone and in-person conversations with selected well owners. If possible, water level measurements will be taken in the selected wells.

4.11.2 Equipment

Equipment to be used for the well inventory consists of the following:

1. Water level indicators (electronic and 200-foot popper tape)
2. Well inventory field form
3. Notebook
4. Map of residences, industries, and well locations
5. Decontamination materials

4.11.3 Procedures

Before initiating field work, the appropriate State of Indiana and Elkhart municipal offices will be contacted to ascertain which areas are currently supplied by the City of Elkhart municipal water supply. All available well logs will be gathered. From this information and data, a list of owners to be contacted will be developed. Initial contact with selected well owners will be made by telephone. Based on these telephone conversations, a door to door well inventory will be performed at the homes of the owners where it appears possible to obtain a water level measurement. A well inventory log will be completed based on the telephone conversation and home visit.

TABLE 4-9

SAMPLING AND ANALYSIS SUMMARY TABLE FOR HIMCO DUMP RI/FS

PHASE II

							FIELD QC						LAB QC			
SAMPLE MATRIX	FIELD PARAMETERS	DQO LEVEL	LAB PARAMETERS	DQO LEVEL	LAB	FIELD SAMPLES	BB(1)	BG	TB(2)	FB	FD	TOTAL TO LAB	LD	MSD(3)	MS	PURPOSE OF SAMPLES
LEACHATE	pH	I	TCL VOA	IV	CLP	7 Max	-	-	1	1	1	10	-	1	1	Waste characterization of primary source
	Conductivity	I	TCL BNA	IV	CLP	7 Max	-	-	-	1	1	9	-	1	1	Risk assessment
	DO	I	TCL PCB/P	IV	CLP	7 Max	-	-	-	1	1	9	-	1	1	Evaluate remedial alternatives
	Temperature	I	Total Metals (4)/CN	IV	CLP	7 Max	-	-	-	1	1	9	1	-	1	
			Water Quality	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			COD	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			Cl	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			SO4	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			NH3	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			NO2 + NO3	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			TKN	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			TP	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			TDS	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			TSS	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			alkalinity	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			BOD	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			VSS	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	-	
			O and G	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			Total Phenol	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	
			Bromide (Diss)	V	CLP SAS	7 Max	-	-	-	1	1	9	1	-	1	

NOTES:

1 Assume bottle cleaning protocol submitted with QAPP acceptable.

2 Trip blanks will be shipped at a frequency of one per cooler of aqueous samples for VOA analysis.

3 MS/MSD samples required for organic analysis. Aqueous samples (surface water, leachate) shall be collected, with extra sample volume at a frequency of one per 20 or fewer investigative samples. Triple the normal volume will be collected for VOAs and double the normal volume will be collected for BNA and PCB/P.

4 Total metals are defined as digestion and analysis of TAL metals on unfiltered samples.

LEGEND

BB = Bottle Blank
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FD = Field Duplicate
LD = Lab Duplicate
MSD = Matrix Spike Duplicate
MS = Matrix Spike
- = Not Applicable
Diss = Dissolved

TABLE 4-9

SAMPLING AND ANALYSIS SUMMARY TABLE FOR HIMCO DUMP RI/FS

PHASE II (Continued)

							FIELD QC						LAB QC			
SAMPLE MATRIX	FIELD PARAMETERS	DQO LEVEL	LAB PARAMETERS	DQO LEVEL	LAB	FIELD SAMPLES	BB(1)	BG	TB(2)	FB	FD	TOTAL TO LAB	LD	MSD(3)	MS	PURPOSE OF SAMPLES
SURFACE WATER (QUARRY, 2 FISH PONDS)	pH	I	TCL VOA	IV	CLP	12 Max	-	3	1	2	2	20	-	1	1	Ecological and human risk assessment
	Conductivity	I	TCL BNA	IV	CLP	9 Max	-	3	-	2	2	16	-	1	1	
	DO	I	TCL PCB/P	IV	CLP	9 Max	-	3	-	2	2	16	-	1	1	
	Temperature	I	Total Metals-Total & Dissolved (4)/CN	IV	CLP	9 Max	-	3	-	2	2	16	1	-	1	
			Water Quality (5)	V	CLP SAS	9 Max	-	3	-	2	2	16	1	-	1	
			COD	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			Cl	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			SO4	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			NH3	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			NO2 + NO3	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			TKN	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			TP	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			TDS	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	-	
			TSS	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	-	
			alkalinity	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	
			Bromide (Diss)	V	CLP SAS	9 Max	-	3	-	2	2	16	2	-	2	

NOTES:

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4 Total metals are defined as digestion and analysis of TAL metals on an unfiltered sample. Dissolved metals are defined as digestion and analysis of TAL metals on a sample filtered in the field.

5 Water quality analyses will be done on unfiltered sample except for bromide which will be field filtered.

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TABLE 4-9

SAMPLING AND ANALYSIS SUMMARY TABLE FOR HIMCO DUMP RI/FS

PHASE II (Continued)

							FIELD QC						LAB QC			
SAMPLE MATRIX	FIELD PARAMETERS	DQO LEVEL	LAB PARAMETERS	DQO LEVEL	LAB	FIELD SAMPLES	BB(1)	BG	TB(2)	FB	FD	TOTAL TO LAB	LD	MSD(3)	MS	PURPOSE OF SAMPLES
SEDIMENT (QUARRY, FISH PONDS)	Benthos ID	I	TCL VOA	IV	CLP	6 Max	-	3	-	-	2	11	-	1	1	Ecological and human risk assessment
		I	TCL BNA	IV	CLP	6 Max	-	3	-	-	2	11	-	1	1	
		I	TCL PCB/P	IV	CLP	6 Max	-	3	-	-	2	11	-	1	1	
		I	Total Metals/CN	IV	CLP	6 Max	-	3	-	-	2	11	1	-	1	
	Depth of organic layer	I	TOC	V	CLP SAS	6 Max		3			2	11	1	-	-	
			Grain Size	V	CLP SAS	6 Max		3			2	11	1	-	-	
WETLAND SOIL BIKE TRAIL RUNOFF SOIL SOILS	Depth of organic layer	I	TCL VOA	IV	CLP	8 Max	-	-	-	-	1	9	-	1	1	Ecological and human risk assessment
			TCL BNA	IV	CLP	8 Max	-	-	-	-	1	9	-	1	1	
			TCL PCB/P	IV	CLP	8 Max	-	-	-	-	1	9	-	1	1	
			Total Metals/CN	IV	CLP	8 Max	-	-	-	-	1	9	1	-	1	
			TOC	V	CLP SAS	8 Max	-	-	-	-	1	9	1	-	-	
			Grain Size	V	CLP SAS	8 Max	-	-	-	-	1	8	-	-	-	
LANDFILL CAP SOIL			Triaxial Compression	V	CLP SAS	5 Max	-	-	-	-	-	5	-	-	-	Evaluate remedial alternatives

NOTES:

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TABLE 4-9

SAMPLING AND ANALYSIS SUMMARY TABLE FOR HIMCO DUMP RI/FS

PHASE II (Continued)

							FIELD QC						LAB QC			
SAMPLE MATRIX	FIELD PARAMETERS	DQO LEVEL	LAB PARAMETERS	DQO LEVEL	LAB	NUMBER OF FIELD SAMPLES	BB(1)	BG	TB(5)	FB	FD	TOTAL TO LAB	LD	MSD(4)	MS	PURPOSE OF SAMPLES
EXISTING AND NEW WELLS GROUNDWATER	Water Level	I	TCL VOA	IV	CLP	18	-	-	2	2	2	24	-	2	2	Determine nature and extent of contamination
	pH	I	TCL BNA	IV	CLP	18	-	-	-	2	2	22	-	2	2	
	Conductivity	I	TCL PCB/P	IV	CLP	18	-	-	-	2	2	22	-	2	2	
	DO	I	Total Metals/CN	IV	CLP	18	-	-	-	2	2	22	2	-	2	Evaluate remedial alternatives
	Temperature	I	(Total and Dissolved) (2)													Risk assessment
			Water Quality (3)	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			COD	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			Cl	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			SO4	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			NH3	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			NO2 + NO3	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			TKN	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			TP	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			TDS	V	CLP SAS	18	-	-	-	2	2	22	3	-	-	
			TSS	V	CLP SAS	18	-	-	-	2	2	22	3	-	-	
			alkalinity	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
			bromide, dissolved	V	CLP SAS	18	-	-	-	2	2	22	3	-	3	
SOIL FROM NEW WELL INSTALLATION	VOAs by HNu	I	TCL VOA	IV	CLP	4 Max	-	-	-	-	1	5	-	-	-	Determine subsurface soil chemistry for evaluation of remedial alternatives nature and extent of contamination
			TCL BNA	IV	CLP	4 Max	-	-	-	-	1	5	-	-	-	
			TCL PCB/P	IV	CLP	4 Max	-	-	-	-	1	5	-	-	-	
			Total Metals/CN	IV	CLP	4 Max	-	-	-	-	1	5	-	-	-	
			TOC	V	CLP SAS	4 Max	-	-	-	-	1	5	-	-	-	
			Grain Size	V	CLP SAS	4 Max	-	-	-	-	1	5	-	-	-	

NOTES:

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2 Total metals are defined as digestion and analysis of TAL metals on an unfiltered sample. Dissolved metals are defined as digestion and analysis of TAL metals on a sample filtered in the field.

3 Water quality analysis will be done on unfiltered sample except for bromide which will be field filtered.

4 MS/MSD samples required for organic analysis. Aqueous samples (groundwater, surface water, leachate, privavte well water) shall be collected, with extra sample volume at a frequency of one per 20 fewer investigative samples. Triple the normal volume will be collected for VOAs and double the normal volume will be collected for BNA and PCB/P.

5 Trip blanks will be shipped at a frequency of one per cooler of aqueous samples for VOA analysis.

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MS = Matrix Spike
- = Not Applicable

TABLE 4-10

SAMPLE VOLUMES, CONTAINERS AND PRESERVATION TECHNIQUES
HIMCO DUMP RI/FS PHASE II

Sample Matrix	Analyses	Container	Preservative	Maximum Holding Time	Minimum Analytical Volume
Cap Soil	Triaxial shear	Quart Mason Jar	None	None	Full
Sediment, Soil	TCL VOA	Two 120-ml wide mouth glass vials	4°C, no headspace	10 Days	Full
	TCL BNA and TCL PCB/P	One 8-oz. wide mouth glass jar	4°C	10 days to extraction 40 days to analysis	3/4 Full
	TAL Metals	One 8-oz. wide mouth glass jar	None	Metals: 180 days Hg: 26 days CN: 12 days	3/4 Full
	TOC	One 8-oz. wide mouth glass jar	None	None	3/4 Full
	Grain Size	Quart mason jar	None	None	Full
Leachate	TCL VOA*	Two 40-ml glass vials with teflon septa	4°C, 1-2 drops HCL to pH <2, no headspace	10 days	Full
	TCL BNA and PCB/P*	Two 80-oz. amber glass bottles OR Four 1-liter amber glass bottles	4°C	5 days to extraction 40 days to analysis	Fill to neck
	TAL Metals	1-liter polyethylene bottle	5 ml 50% HNO_3, per liter to pH <2	Metals: 180 days Hg: 26 days	Fill to neck
	Cyanide	1-liter polyethylene bottle	4°C, 5 ml 6N NaOH per liter to pH >12	12 days	Fill to neck
	Water Quality I Chloride Sulfate TDS TSS VSS Alkalinity BOD	Water Quality I Four 1-liter polyethylene bottles	4°C for all	Chloride: 28 days Sulfate : 28 days TDS: 7 days TSS: 7 days VSS: 48 hours Alkalinity: 14 days BOD: 48 hours	Chloride: 50 mls Sulfate: 50 mls TDS: 100 mls TSS: 100 mls BOD: 100 mls Alkalinity: 100 mls VSS: 200 mls

TABLE 4-10

SAMPLE VOLUMES, CONTAINERS AND PRESERVATION TECHNIQUES
HIMCO DUMP RI/FS PHASE II
(Continued)

Sample Matrix	Analyses	Container	Preservative	Maximum Holding Time	Minimum Analytical Volume
	Water Quality II	Water Quality II			
	TP	Two 1-liter polyethylene bottles	4°C, 1 ml H_2SO_4 per liter to pH <2	TP: 28 days	TP: 125 mls
	TKN			TKN: 28 days	TKN: 500 mls
	NH_3			NH_3: 28 days	NH_3: 500 mls
	NO_2+NO_3			NO_2+NO_3: 28 days	NO_2+NO_3: 100 mls
	COD			COD: 28 days	COD: 50 mls
	Bromide (field filtered)	One 250-ml polyethylene bottle	None	48 hours	100 mls
	Oil and Grease Total Phenol	Two 1-liter glass bottles	4°C, 1-2 ml H_2SO_4 per Liter to pH <2	28 days	Full
Surface Water	TCL VOA*	Two 40-ml glass vials with teflon septa	4°C, 1-2 drops HCL to pH <2, no headspace	10 days	Full
	TCL BNA and PCB/P*	Two 80-oz. amber glass bottles OR Four 1-liter amber glass bottles	4°C	5 days to extraction 40 days to analysis	Fill to neck
	TAL Metals (total)	1-liter polyethylene bottle	5 ml 50% HNO_3, per liter to pH <2	Metals: 180 days Hg: 26 days	Fill to neck
	TAL Metals (field filtered)	1-liter polyethylene bottle	5 ml 50% HNO_3, per liter to pH <2	Metals: 180 days Hg: 26 days	Fill to neck
	Cyanide	1-liter polyethylene bottle	4°C, 5 ml 6N NaOH per liter to pH >12	12 days	Fill to neck
	Water Quality I	Water Quality I			
	Chloride	Four 1-liter polyethylene bottles	4°C for all	Chloride: 28 days	Chloride: 50 mls
	Sulfate			Sulfate : 28 days	Sulfate: 50 mls
	TDS			TDS: 7 days	TDS: 100 mls
	TSS			TSS: 7 days	TSS: 100 mls
	Alkalinity			Alkalinity: 14 days	Alkalinity: 100 mls
	Water Quality II	Water Quality II			
	TP	Two 1-liter polyethylene bottles	4°C, 1 ml H_2SO_4 per liter to pH <2	TP: 28 days	TP: 125 mls
	TKN			TKN: 28 days	TKN: 500 mls
	NH_3			NH_3: 28 days	NH_3: 500 mls
	NO_2+NO_3			NO_2+NO_3: 28 days	NO_2+NO_3: 100 mls
	COD			COD: 28 days	COD: 50 mls
	Bromide (field filtered)	One 250-ml polyethylene bottle	None	48 hours	100 mls

TABLE 4-10

SAMPLE VOLUMES, CONTAINERS AND PRESERVATION TECHNIQUES
HIMCO DUMP RI/FS PHASE II
(Continued)

Sample Matrix	Analyses	Container	Preservative	Maximum Holding Time	Minimum Analytical Volume
Groundwater	TCL VOA*	Two 40-ml glass vials with teflon septa	4°C, 1-2 drops HCL to pH <2, no headspace	10 days	Full
	TCL BNA and PCB/P*	Two 80-oz. amber glass bottles OR Four 1-liter amber glass bottles	4°C	5 days to extraction 40 days to analysis	Fill to neck
	TAL Metals (total)	1-liter polyethylene bottle	5 ml 50% HNO_3, per liter to pH <2	Metals: 180 days Hg: 26 days	Fill to neck
	TAL Metals (field filtered)	1-liter polyethylene bottle	5 ml 50% HNO_3, per liter to pH <2	Metals: 180 days Hg: 26 days	Fill to neck
	Cyanide	1-liter polyethylene bottle	4°C, 5 ml 6N NaOH per liter to pH >12	12 days	Fill to neck
	Water Quality I Chloride Sulfate TDS TSS Alkalinity	Water Quality I Two 1-liter polyethylene bottles	4°C for all	Chloride: 28 days Sulfate : 28 days TDS: 7 days TSS: 7 days Alkalinity: 14 days	Chloride: 50 mls Sulfate: 50 mls TDS: 100 mls TSS: 100 mls Alkalinity: 100 mls
	Water Quality II TP TKN NH_3 NO_2+NO_3 COD	Water Quality II Two 1-liter polyethylene bottles	4°C, 1 ml H_2SO_4 per liter to pH <2	TP: 28 days TKN: 28 days NH_3: 28 days NO_2+NO_3: 28 days COD: 28 days	TP: 125 mls TKN: 500 mls NH_3: 500 mls NO_2+NO_3: 100 mls COD: 50 mls
	Bromide (field filtered)	One 250-ml polyethylene bottle	None	48 hours	100 mls

NOTE: * Triple volume must be collected for MS/MSD analyses for volatiles, double volume must be collected for BNA & PCB/P analyses.

TABLE 4-11

SAMPLING PLAN RATIONALE

ON-SITE SAMPLE NUMBERS	RATIONALE/COMMENTS
SS13-SS18	- Characterize nature and extent of contamination of surface water - Assess human health risk by direct contact or ingestion
GE07-GE11	- Hand auger sample of the landfill cap for consolidated undrained triaxial compression testing to be used for deep seated slope stability cap design calculations
SS08-SS10	- Resample these surface water locations for volatile organic analysis, only
SD13-SD18	- Characterize nature and extent of contamination of sediment - Assess human health risk by direct contact or ingestion
WS17-WS19	- Characterize nature and extent of contamination of wetland soils - Assess human health risk by direct contact or ingestion
HS01-HS05	- Characterize nature and extent of contamination of surface soil - Assess human health risk by direct contact or ingestion
TL1-TL7	- Characterize nature of contamination of leachate - Assess human health risk by direct contact or ingestion
WT111A	- New monitoring well to obtain source of groundwater near Kolanowski shallow well for chemical characterization
GT11A-GT11D	- Four soil samples collected from new monitoring well boring. "A" corresponds to sample collected from 0-2 feet, "B" from 5-7 feet, "C" from 10-12 feet, and "D"from 15-17 feet. These samples will be collected to characterize nature and extent of soil contamination near Kolanowski shallow well

TABLE 4-11

SAMPLING PLAN RATIONALE
(Continued)

TRENCH NUMBERS		RATIONALE/COMMENTS
TL1-TL7	-	Leachate trench numbers correspond to leachate sample numbers
TD1-TD6	-	Trenches to delineate extent of the construction debris area associated with high PNA concentrations

OFF-SITE SAMPLE NUMBERS		RATIONALE
SS19-SS21	-	Characterize off-site surface water for use as a potential background sample
SD19-SD21	-	Characterize off-site sediment for use as a potential background sample

A/P/HIMCO/AI0

BRIS DELINEATION

ACHATE COLLECTION

GEOTECHNICAL SAMPLE

G WELL

SAMPLE FROM
LL

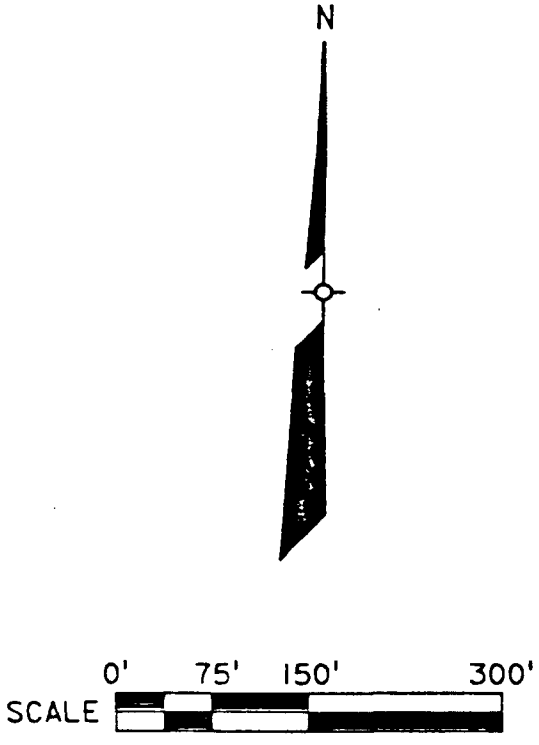


FIGURE 4-4
PROPOSED PHASE II
SAMPLING LOCATIONS
HIMCO DUMP
SUPERFUND SITE

ELKHART, INDIANA

B

A

Sheet No.	
Off. Loc.	File No.
Project No.	

4.11.4 Decontamination

All equipment coming into contact with groundwater will be cleaned between well locations in the following manner:

1. Alconox and water wash
2. Tap water rinse
3. Isopropanol rinse
4. Two distilled water rinses

Decontamination rinses containing isopropanol will be containerized for eventual discharge at the municipal wastewater treatment system.

4.11.5 Quality Control

Field documentation will undergo an internal Quality Control (QC) review after the completion of field activities. Original field forms will be reviewed by the Site Quality Control Officer (SQCO) for completeness, accuracy, and compliance with the FSP and Quality Assurance Project Plan (QAPP). Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.11.6 Documentation

Data collected and observations made during the private well inventory will be recorded on the following field documentation forms (Appendix A1):

1. Well inventory log
2. Daily time log
3. Photographs of locations

4.12 SURFACE WATER AND SEDIMENT SAMPLING

4.12.1 Introduction

Two surface water and two sediment samples will be taken from the "L" shaped pond, one surface water and one sediment sample will be taken from the small pond northeast of the "L" shaped pond, and three sediment samples and up to six surface water samples will be taken from the quarry pond. Three surface water and three sediment samples will also be taken from a surface water body similar to the ponds on-site at an off-site background location.

Also, three surface water samples for volatile organic analysis (VOA) only will be collected from Phase I sampling locations SS-08, SS-09, and SS-10. The original VOA samples from these locations were not analyzed due to disruption of the chain-of-custody for these samples.

4.12.2 Equipment

The following equipment will be used for surface water and sediment sampling:

1. Small flat bottomed boat
2. 300 feet of 1/4-inch diameter anchor rope and dredge sampler rope
3. Dredge sampler (Ekman and Ponar will both be available)
4. Stainless steel bowls and spoons
5. Brushes
6. Plastic garbage bags
7. Alconox
8. Isopropanol-American Chemical Society (A.C.S.)
9. Water (distilled and tap)
10. Fiberglass weighted measuring tape (200 feet)
11. Field notebook
12. Map of ponds
13. Coolers
14. Ice
15. Sample bottles
16. Personnel flotation devices
17. Gravity core sampler
18. Temperature probe
19. Brunton compass
20. Benthos screen
21. Millipore filtration apparatus, 0.45 micron and coarse filters
22. Nitrogen cylinder for field filter
23. pH, conductivity, dissolved oxygen (DO) meters
24. Floating sample location marker
25. Personal Protective Equipment (PPE) as specified in the Health and Safety Plan (HASP)

4.12.3 Procedures

4.12.3.1 Surface Water

The location of the surface water sample will be described in the field notebook based on estimation. The location will be marked with a float. The float location will later be surveyed and plotted on the site base map. A temperature probe will be lowered to the pond bottom with the temperature being recorded every two feet. If the difference in temperature between the pond surface and pond bottom is 9°C or greater, then two surface water samples will be collected at each location, one from near the surface and one from the deeper, colder layer. It is anticipated that thermal stratification will only be found in the quarry pond. (Source of 9°C stratification cutoff value: Peavy, H., D. Rowe and G. Tchobanoglous, Environmental Engineering, page 73, McGraw-Hill, 1985.)

The near surface water samples will be obtained from a boat by lowering the capped sample bottles to a depth just below the surface, unscrewing the bottle cap, allowing the water sample to drain in, and capping the bottle below the

surface. If thermal stratification is found, deep water samples will be collected near the pond bottom using a Keck pump. The Keck pump will be lowered to the desired depth in the pond and the pump started. Sample bottles will be filled directly from the pump outlet after running the pump for one minute.

The surface water sample will be collected before the sediment sample at all locations. Measurement of pH, conductivity, and DO will be done immediately. The analytes, preservatives, and sample bottles are provided in Table 4-10. Samples for bromide will be field filtered.

4.12.3.2 Sediment

Sediment samples will be collected for chemical analysis and for identification of benthic organisms. Sediment sample locations correspond to the surface water locations.

At each sample location a dissolved oxygen meter probe will be lowered to the sediment surface and a reading taken. If conditions are found to be aerobic, two sediment grab samples will be collected by lowering a dredge sampler over the edge of the boat. Once the dredge has settled to the bottom, a messenger will be sent down the haul line to trip the dredge to close. The dredge will then be hauled up to the surface. Both Ekman and Ponar dredges will be available for use. The sediment will be poured from the dredge to a benthos screen. Pond water will be washed through the sediment and mesh. The benthic organisms remaining will be identified and recorded in the log book by an ecologist. The second dredge sample will then be collected and processed in the same manner. If sediments are found to be anoxic at sampling locations, dredge samples will be collected from near shore areas for benthic organism identification.

Once benthic organism identification is finished at a sampling location, or if sediments are found to be anoxic at a sampling location, the dredge will be lowered to the pond bottom and a sediment sample collected for chemical analysis. The excess water will be poured from the dredge sample, and jars for volatile analysis will be filled directly from the dredge. The remaining sample volume will be emptied into a stainless steel bowl. The dredge sampler will then be reset and lowered to the bottom for additional sample volume. Once sufficient volume has been collected in the bowl, the excess water will be drained. The sediment will be mixed with a spoon until a homogeneous mixture results. The mixture will be divided into four quarters. Portions from each quarter will be added to each jar until the required jars have been filled. A table of analytes and sample volumes is provided (Table 4-10). Visual observations and the Unified Soil Classification System (USCS) classification of the sediment will be recorded on field forms.

Gravity core samples will be collected to determine the stratigraphy of the approximately first 0.5 to 2.0 feet (dependent on core recovery) of sediment. This will be accomplished by allowing a corer to free fall through the water to the lake bottom. The corer will be retrieved with a smooth, continuous lifting motion to minimize sediment loss. Cores will be opened, photographed,

and logged by an on-site geologist using the USCS classifications. The thickness of the organic layer will be included in the core sample description. This information will be recorded on the Sediment Core Log (Appendix A1). Samples for grain size analysis will be selected by the geologist and placed in geotechnical sample jars. One sample per location will be sent to the selected geotechnical lab. A gravity core sampler works best in fine grained sediments. If the sediments in the Himco Dump ponds are found to be sandy or gravelly, core recovery may be minimal.

4.12.4 Decontamination

The dredge sampler, stainless steel bowl and spoon, and gravity core sampler will be decontaminated between sample locations by:

1. Alconox and water wash
2. Tap water rinse
3. Isopropanol (A.C.S.)
4. Two distilled water rinses

The outside of the boat will be rinsed with tap water once removed from a pond.

Decontamination rinses containing isopropanol will be containerized for eventual discharge to the municipal wastewater treatment system.

4.12.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

Field QC samples to be collected are summarized in Table 4-9.

4.12.6 Documentation

Data collected and observations made during surface water and sediment sampling will be recorded on the following field documentation forms (Appendix A1):

1. Daily time log
2. Sediment and surface water collection form
3. Photographs
4. Sediment core log

4.13 SURFACE SOIL SAMPLING

4.13.1 Introduction

Eight surface soil samples (does not include field QC samples) will be collected for chemical analysis during the Phase II investigation. Three wetland soil samples will be collected from the wetland area directly south of the quarry pond, two surface soils will be collected west of the "L" shaped pond, and three surface soils will be collected along the south side of the quarry pond fence, evenly spaced along a dirt bike trail. The samples will be located to investigate areas of suspected contamination, or randomly spread out over the three areas if no staining or apparent stressed vegetation is present. Soil samples will be composited from each sampling location in depths ranging from 0 to 18 inches.

4.13.2 Equipment

The equipment used to collect soil samples for chemical analysis consists of:

1. Stainless steel hand auger
2. Site map
3. Field notebook
4. Field forms
5. Munsell Color Chart
6. Tape measure
7. Stainless steel bowl
8. Stainless steel spoon
9. Flagging tape
10. Wooden lath
11. Compass
12. Camera
13. PPE as specified in the HASP

4.13.3 Procedures

Each soil sample will be collected with a hand auger. Grab samples for volatile organic analysis will be collected immediately from the auger by filling two 120 ml vials with no head space. Additional soil will then be placed in a stainless steel bowl. Each sample will be classified (USCS) and examined for obvious signs of contamination. This information will be recorded on a Soils Data Form. A stainless steel spoon will be used to stir the soil until a homogeneous mixture is obtained. The soil mixture will be divided into four quadrants and small samples will be taken from each quadrant and placed in the appropriate sample jars. The containers and sample volumes required are listed in Table 4-10.

4.13.4 Decontamination

The hand auger, stainless steel spoons, and stainless steel bowls will be decontaminated between sampling points by:

1. Alconox and tap water wash
2. Tap water rinse
3. Isopropanol rinse (A.C.S.)
4. Two distilled water rinses

Decontamination rinses containing isopropanol will be containerized for eventual discharge to the municipal wastewater treatment system.

4.13.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

Field QC samples to be collected are summarized in Table 4-9.

4.13.6 Documentation

Data collected and observations made during surface soil sampling will be recorded in a field notebook and on the following field documentation forms (Appendix A1):

1. Daily time log
2. Soil data form
3. Photographs of sampling locations

4.14 TRENCHING FOR LEACHATE SAMPLING AND DEBRIS DELINEATION

4.14.1 Introduction

Two previously excavated trenches at the landfill where leachate was observed will be re-excavated to allow the collection of leachate. The leachate samples will be analyzed to evaluate leachate treatment methods, and to evaluate pretreatment requirements for possible discharge to the Elkhart POTW.

Additionally, eleven trenches will be excavated in the area of construction debris associated with high polynuclear aromatic (PNA) compound concentrations. Leachate samples will be collected from five of the eleven trenches. All eleven trenches will be used to delineate the extent of the construction debris. This delineation will be used to develop a total volume calculation to be used in determining a remediation method. Therefore, a total of thirteen trenches will be excavated of which seven will be sampled for leachate.

4.14.2 Equipment

The equipment to be used for trenching and leachate sampling consists of:

1. PPE as specified in the HASP
2. OVA
3. LEL/O_2/H_2S meter
4. Camera and film
5. Sample bottles and preservatives as listed in Table 4-10
6. pH, conductivity, and DO meters, and thermometer
7. Tap water, distilled water, and A.C.S. isopropanol
8. Five gallon pail with cover for collection of isopropanol rinses
9. Alconox soap
10. pH paper
11. Coolers
12. "Blue" ice or equivalent
13. pH meter buffer solutions,conductivity meter calibration solution
14. Telescoping heavy duty aluminum pole
15. Adjustable beaker clamp (attached to pole end)
16. Field forms
17. Field notebook
18. Millipore filtration apparatus, 0.45 micron and coarse filters
19. Nitrogen cylinder

4.14.3 Procedures

Two trenches (TL-1 and TL-2) for leachate collection will be excavated at previous trench locations T-9 and T-17. Five trenches (TL-3 through TL-7) for leachate collection will be excavated in the area of construction debris associated with high PNA concentrations. Prior to beginning trench excavation activities, the trench locations will be staked and a work zone established. One Donohue field person will monitor the downwind direction of the trench using an OVA and LEL/O_2/H_2S meter. Another Donohue field person will log the trench by describing the types of waste and soil encountered, photographing any significant objects or staining, and recording this information on a trench log form. This person will not enter the trench, but will use a flashlight to log the trench from the ground surface. This person will also use an OVA and LEL/O_2/H_2S meter to monitor and log the atmosphere near the trench as the excavation proceeds. Each trench will be excavated until leachate is encountered. Trenches TL-1 and TL-2 will be excavated to an approximate length of 10 feet. Because trenches TL-3 through TL-7 are to be excavated for construction debris delineation as well as leachate sampling, these trenches will be excavated to an approximate length of 25 feet. Once leachate is encountered, a sample collection beaker attached to a sampling rod will be lowered into the excavation and filled. Once full, the beaker will be brought out of the trench to fill the sample bottles. The beaker will be refilled as many times as required to fill all of the sample bottles. Samples for bromide will be field filtered. Measurement of pH, conductivity, DO, and temperature will be done immediately.

Approximately six trenches (TD-1 through TD-6) will be excavated in the area of construction debris located south of the landfill cap, which is associated with high PNA concentrations. The locations will be staked by the field geologist with wooden lath identifying the trench number. Prior to excavating, a work zone will be established by cordoning off the area with caution tape. The geologist will direct the backhoe operator for the lateral and vertical extent of each trench. The geologist will monitor the atmosphere using and OVA and LEL/O_2/H_2S meter and record the instrument readings periodically on an atmospheric monitoring log as the excavation proceeds. A second Donohue field person will monitor the air outside the work zone downwind of the excavation using an OVA and LEL/O_2/H_2S meter. The excavation will proceed outward from the construction debris area until natural soil is encountered. The dimensions of the debris delineation trenches will be approximately 10 feet deep by 25 feet long. The geologist will describe the types of waste and soil encountered, photograph any significant objects or staining, and record this information on the trench log form, daily time log, and atmospheric monitoring log. The geologist will not enter the trench. The trench will be backfilled with the excavated material immediately following completion of the trench as directed by the geologist. The geologist will re-stake the actual excavated area of the trench. A survey team will later survey in the trench locations for plotting on the existing CADD site map.

4.14.4 Decontamination

Upon mobilization to the site, in between the seven leachate collection trenches, and upon demobilization from the site, the backhoe will be washed with hot water using a power washer to minimize the potential for cross-contamination.

4.14.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.14.6 Documentation

Trench observations made by the on-site geologist during excavation activities will be recorded on the appropriate field forms shown in Appendix A1. This will include:

1. Daily time logs
2. Trench logs
3. Atmospheric monitoring logs
4. Photographs and descriptions
5. Sample collection form

4.15 GROUNDWATER SAMPLING PLAN

Boring, monitoring well, and groundwater sampling rationale are summarized in Table 4-11. Approximate sampling locations are shown in Figure 4-4.

4.15.1 Soil Boring and Sampling

4.15.1.1 Introduction

One 16-foot well will be installed approximately 100 feet northeast of the existing Kolanowski shallow well. Four subsurface soil samples will be collected at five foot intervals to further define the stratigraphy of the site and for chemical and geotechnical analysis.

Drilling, soil sampling, and monitoring well installation will be performed by a qualified drilling subcontractor under the direct supervision of a geologist who will visually inspect, classify according to USCS, complete a drilling log, and containerize samples.

4.15.1.2 Equipment

Equipment and materials used during soil boring and geotechnical sampling activities will include:

1. A fully-equipped drill rig capable of:
    a. Accomplishing soil boring with 4 1/4-inch ID hollow stem augers to an approximate 16-foot depth.
    b. Performing intermittent or continuous sampling to include 2-inch (I.D.) standard or stainless split-spoon samplers, shelby tubes, or other continuous sampling system.
    c. Providing penetration test information for soils.
2. Fiberglass tape of adequate length to measure depth of boring.
3. Generator, steam cleaner, and related equipment.
4. Tap water.
5. Camera and film.
6. Munsell Soil Color Chart.
7. Hard hat, safety glasses, and steel-toed shoes.
8. Field logs and data forms.
9. Field notebook.
10. Indelible marking pen and black ink pen.
11. Sample jars (as listed in Table 4-10), labels, tags, and forms.

4.15.1.3 Procedures

One boring will be advanced using hollow stem augers. The boring will be sampled at five foot depth intervals unless the geologist determines in the field that more frequent sampling intervals are necessary. Samples will be retrieved using a split-spoon sampler or shelby tube at five foot intervals.

The geologist will classify and log the samples using the USCS and Munsell Soil Color Chart. Four soil samples will be taken for chemical and geotechnical analysis from the following depth intervals: 0 to 2 feet, 5 to 7 feet, 10 to 12 feet, and 15 to 17 feet. The soil samples will be screened with an HNu photoionization detector. In order to prevent cross-contamination the split spoon sampler will be decontaminated between samples by methods described below.

4.15.1.4 Decontamination

Upon mobilization to the site the drill rig, drilling tools, and sampling equipment will be decontaminated to minimize the potential for cross-contamination. The drilling subcontractor will supply all equipment necessary to steam-clean the drilling equipment. The decontamination procedure will involve steam-cleaning the drill rig, drilling tools, and sampling equipment in a predetermined location away from the groundwater monitoring wells. The split spoon will be washed between samples using Alconox and will be rinsed with distilled water. Wash water resulting from this activity will be discharged to the ground downgradient of the well location.

4.15.1.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.15.1.6 Documentation

Soil boring information and other observations made by the on-site geologist during drilling activities will be recorded on the appropriate field forms shown in Appendix A1. This will include:

1. Daily Time Logs
2. Soil Boring Logs
3. Atmospheric Monitoring Logs
4. Photographs and descriptions

Photographs of soil boring samples will be processed and labeled with adhesive documentation labels.

4.15.2 Monitoring Well Installation

4.15.2.1 Introduction

One new monitoring well will be installed to an approximate depth of 16 feet. The approximate location is shown on Figure 4-4. The actual finished depth will depend on the water table and site stratigraphy as determined in the field by the site geologist. The final well screen placement will be determined in the field.

The purpose of this monitoring well will be to further investigate aquifer conditions near the Kolanowski shallow well which exhibited high lead concentrations in Phase I sampling.

4.15.2.2 Equipment

Equipment to be used during monitoring well installation activities will include:

1. Drill rig with the capability of:
   a. Advancing soil borings for well installation with 4-1/4-inch (I.D.) hollow-stem augers (with knock-out plug).
   b. Completing monitoring well installation.
2. Fiberglass tape of adequate length to measure the bottom of the well.
3. Electric water level indicator of adequate length (100 feet).
4. Field notebook and field documentation forms.
5. Tap water.
6. Liquinox detergent.
7. Generator, steam cleaner, and related equipment.
8. Brush to clean split spoon.
9. Camera and film.
10. Well construction materials to be supplied by drilling subcontractor include:
    a. Two-inch (I.D.), flush-threaded 0.010-inch slot Schedule 40 stainless steel screen, ten feet in length.
    b. Two-inch (I.D.), flush-threaded Schedule 40 stainless steel riser pipe.
    c. Rubber O-rings or teflon-thread wrap tape.
    d. Two-inch (I.D.), flush-threaded stainless steel cap and bottom plug.
    e. Neat cement, cement-bentonite, or Volclay grout.
    f. Bentonite pellets.
    g. Washed, well-sorted No. 50 silica sand.
    h. Four-inch nominal diameter steel protective casing with locking cover.
    i. Lock.
11. Isopropanol (A.C.S.).
12. pH, DO, and conductivity meters.
13. Thermometer.
14. Five-gallon container to collect equipment decontamination rinsate.
15. Keck pump with backflow check value.

4.15.2.3 Procedures

If necessary, the boring drilled for the purpose of well installation will be accomplished using hollow stem augering techniques with the utilization of a

knockout plate to prevent sand heaving while drilling. If a knockout plate is used, subsurface soil sampling will be accomplished separately from hollow stem auger drilling of the borehole for well installation.

The minimum borehole diameter for monitoring well installation will be 3-7/8 inches. The monitoring well will be constructed of a 2-inch (I.D.), flush-threaded 0.010-inch slot, Schedule 40 stainless steel well screen with Schedule 40 stainless steel riser. The screen length will be 10 feet.

Due to the shallow depth to the water table, the monitoring well will be constructed as follows. The annular space between the well screen and the borehole wall will be backfilled with No. 50 sand and will extend one foot above the well screen. The well screen will be set so the water table intersects the screen two feet below the top of the screen. The remaining five feet of the borehole annular space from the ground surface down to the top of the sand filter pack is required for well construction materials which include a three foot cement collar and a two foot bentonite seal. A four inch diameter steel protective casing with locking lid will be cemented in place over the stainless steel riser. Stainless steel risers will be provided with vented caps.

The well will be developed after a minimum of 24 hours has elapsed following the completion of well construction. Well development will consist of pumping the well using a Keck pump. Intermittent surging will be performed, if appropriate, to aid in removal of fine-grained material. Well development will continue until at least five well volumes have been removed and the water being removed from the well has the following characteristics:

- Water is silt free
- Water temperature is stabilized to $\pm 0.5^{\circ}C$
- pH is stabilized to ± 0.1 units
- Conductivity is stabilized to ± 10 percent

The method to be used to calculate the well volume is presented in Section 4.15.4.3.

Field instruments calibration results will be recorded on Field Meter Instrument Calibration Logs (Appendix A1).

4.15.2.4 Decontamination

Soil boring and monitoring well installation equipment will be decontaminated upon arrival on-site and after well installation. Decontamination of drill rigs, vehicles, and other equipment will be accomplished with high-pressure hot-water steam cleaning. Additional scrubbing may be required to remove encrusted material.

Decontamination of the riser, well screens, and end caps will consist of high-pressure hot-water steam cleaning. Workers shall use clean cotton gloves when handling riser and well screen. Decontamination of well development equipment

will consist of: Alconox and water wash, followed by a tap water rinse, an isopropanol rinse, (distilled water only in Keck pump) and two rinses with distilled water. Wastewater fluids, except isopropanol rinses, generated during drilling, and water removed from the wells during development, will be discharged to the ground surface. Decontamination rinses containing isopropanol will be containerized for discharge to the municipal wastewater treatment system.

4.15.2.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO who will review the field forms for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.15.2.6 Documentation

Data collected and observations made during the installation of the monitoring well will be recorded on the appropriate field forms included in Appendix A1. Documentation will include:

1. Daily Time Log
2. Observation Well Installation Diagram
3. Well Development Form
4. Field Meter Instrument Calibration Logs
5. Atmospheric Monitoring Log

4.15.3 Hydraulic Characterization

4.15.3.1 Introduction

Following the development of the new monitoring well TW111A, field hydraulic conductivity tests (slug tests) will be conducted and water level measurements will be taken to determine the hydraulic characteristics of the aquifer. The procedures to be followed during aquifer hydraulic characterization are presented in this section.

4.15.3.2 Equipment

Equipment includes the following:

1. Stainless steel slug
2. Rope or cord
3. Watch with a second hand
4. Electric water level indicator
5. Water level data logger with pressure transducer
6. Data log book
7. Field documentation forms

8. Liquinox detergent
9. Deionized water
10. Tap water
11. Isopropanol (A.C.S.)
12. Five-gallon pail with cover to collect decon rinsate

4.15.3.3 Procedures

Well TW111A will be slug tested following well development to determine the hydraulic conductivity of the formation materials near the well. Both falling and rising head tests will be recorded on an in-field permeability form included in Appendix A1.

The pressure transducer will be lowered below the static water level to a depth which allows the slug to be lowered into the water without coming into contact with the transducer. The maximum transducer depth will be limited by the settings of the data logger and will be addressed when setting up the test. The rising or falling water level produced by dropping the slug into or pulling the slug out of the water will be recorded by a data logging device. A computer program will be used to calculate the hydraulic conductivity values.

4.15.3.4 Decontamination

All slugs and water level measurement equipment, with the exception of the pressure transducer, will be decontaminated before use and at each well location as follows:

1. Wash with Alconox and water solution
2. Rinse with tap water
3. Isopropanol rinse
4. Rinse twice with distilled water

A distilled water rinse only (with no Alconox and water) will be used to decontaminate the pressure transducer.

4.15.3.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO who will review the field forms for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.15.3.6 Documentation

Data collected and observations made during in-field permeability tests and water level measurements will be recorded on the appropriate field documentation forms in Appendix A1. Forms will consist of:

1. Daily time logs
2. In-field permeability form
3. Water elevation form

4.15.4 Groundwater Sampling

4.15.4.1 Introduction

The following new and existing groundwater monitoring wells will be sampled in order to further define the vertical and horizontal extent and degree of contamination of the uppermost aquifer and lower confined aquifer: 101A, 101B, 101C, 102A, 102B, 102C, 103A, 104A, 105A, 106A, B2, B3, B4, E2, M1, M2, CP-1 and the new well 111A. Locations of the monitoring wells to be sampled are shown in Figure 4-4. Groundwater samples from new and existing monitoring wells will be analyzed for Target Compound List (TCL), VOC, BNA, PCBs/pesticides, Target Analyte List (TAL) metals/cyanide, and water quality.

Sample integrity will be maintained by decontaminating field equipment between wells and adhering to U.S. EPA sample preservation, packaging, and chain-of-custody protocol.

4.15.4.2 Equipment

The equipment to be used for groundwater sampling consists of:

1. Keck pump with back-flow check valve.
2. Electric water level indicator, water level popper, or teflon-coated woven tape.
3. Field notebook.
4. Millipore field filtration apparatus.
5. 0.45-millimeter filters.
6. Nitrogen gas cylinder and regulator for filtering apparatus.
7. Conductivity meter.
8. pH meter and pH 7 and 10 calibration buffer solutions.
9. Thermometer.
10. Tap water, deionized water, and A.C.S. isopropanol.
11. Five-gallon pail with cover for collecting and storing isopropanol rinses.
12. Liquinox detergent.
13. EPA Region V sample tags and SMO traffic report labels.
14. Plastic sheeting.
15. Sample containers and preservatives as listed in Table 4-2.
16. HDPE filtration jugs.
17. pH paper.
18. Coolers.
19. "Blue" ice or equivalent.
20. Plastic containers for transport of sampling equipment to the site.
21. Large plastic garbage bags to store used plastic sheeting, etc.

4.15.4.3 Procedures

In order to prevent contamination during transport to the site, all sampling equipment will be stored in clean plastic containers. A new sheet of clean plastic sheeting will be used at each sampling location to provide a clean surface on which to place sampling equipment during sample collection. Used sheeting will be stored in plastic garbage bags, and then disposed.

Before beginning the purging process, field meters will be calibrated and the results of the meter calibrations will be recorded on the field meter instrument calibration logs in Appendix A1.

Before purging begins, the volume of water to be removed from the well will be determined. At least five times the measured volume will be purged. To measure the well volume, the depth to the static water level and to the bottom of the well will be measured from the survey reference point. The measuring tape will be rinsed several times with distilled water between measurements at each well. By using the depth to water, well depth, and well radius, the volume of standing water in the well (well volume) will be calculated using the following equation:

$$\text{well volume (gallons)} = 3.14r^2 \times h \times 7.48 \text{ gallons/ft}^3$$

where r = well radius (feet) and h = water height (feet).

Before pumping begins with the Keck pump, and after each of the five well volumes is removed, measurements of pH, conductivity, temperature, and turbidity will be recorded on the Well Purging and Sample Collection Form included in Appendix A1. Pumping should continue until the readings have stabilized to pH $\pm$0.1 unit, conductivity $\pm$10 percent, temperature $\pm$0.5^{o}C. The total volume of water removed during the purging process will be recorded. If the conductivity exceeds 5,000 umhos/cm, a note on the SAS packing list will indicate the conductivity reading and state "check for possible chloride interference."

Following the well purging process, groundwater samples will be collected with the Keck pump. The time between the completion of purging and collection of the sample is not to exceed 24 hours unless the rate of recovery of the well requires more time for a sample to collect in the well.

Table 4-10 summarizes sample containers and preservatives to be used. Following the addition of any chemical preservative, sample pH will be checked in the field with pH paper to ensure that adequate preservative was added.

Samples for dissolved metals and bromide analysis will be collected in a HDPE filtration jug and filtered immediately. Following field filtering, the metals aliquot will be preserved with nitric acid. The pH of the preserved sample will be checked to ensure that adequate preservative was added. No preservative will be added to the bromide aliquot. Performance of field-filtering will not be indicated on paperwork accompanying metals samples to

the lab because these samples will be digested in order to analyze the "total dissolved" fraction of metals. Samples for total metals will not be field filtered.

All samples will be stored in coolers containing blue ice or its equivalent in a locked secure area until custody is relinquished.

4.15.4.4 Decontamination

The outer parts of the Keck pump which come into contact with groundwater will be cleaned between wells by: 1) Alconox and water wash, 2) tap water rinse, 3) isopropanol rinse, and 4) two distilled water rinses, The inner parts of the Keck pump will be cleaned by pumping one gallon of distilled water through the pump and tubing system in between well locations. Decontamination rinses containing isopropanol will be containerized for eventual discharge to the municipal wastewater treatment system.

4.15.4.5 Quality Control

In order to verify the quality of the sampling process, sample blanks and duplicates will be collected during the sampling process. The number of QC samples to be collected is listed in Table 4-9. Samples selected for matrix spike analysis will require additional the volume as listed in Table 4-10.

Field blanks will be taken at a frequency of one per every ten field samples collected. Field blanks will be collected for each sampling round. Field blanks for dissolved metals must be field-filtered. Field blank samples will be collected after the Keck pump is decontaminated by pumping distilled water through the Keck pump and collecting the water in the appropriate bottles listed in Table 4-10.

Field duplicates will be collected at the frequency of one duplicate during the collection of every ten field samples. A field duplicate sample is a second sample collected consecutively from one well using the decontaminated Keck pump.

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO who will review the field forms for completeness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.15.4.6 Documentation

Data collected and observations made during groundwater sampling will be recorded on the following field documentation forms (Appendix A1):

1. Daily Time Log
2. Well Purging and Sample Collection Form

3. Well Development Form
4. Field Meter Instrument Calibration Log

4.16 LANDFILL CAP SOIL SAMPLING

4.16.1 Introduction

A maximum of five soil samples (GE07-GE11) will be collected for geotechnical analysis as identified by a geotechnical engineer from the existing landfill cap using a hand auger. The samples will be tested for shear strength by the triaxial shear method. These tests will be done to evaluate the potential for slope failure of a new landfill cap constructed over the existing cap.

4.16.2 Equipment

The equipment used to collect the geotechnical soil samples consist of:

1. Stainless steel hand auger
2. Field notebook
3. Stainless steel trowels
4. Flagging tape
5. Camera
6. PPE as specified in the HASP
7. Sample jars

4.16.3 Procedures

Each soil sample for geotechnical analysis will be composited using a hand auger from a depth of 0 to 18 inches. Sample material will be transferred directly from the hand auger to quart mason jars using a trowel.

The locations of the geotechnical soil samples will be selected so that three samples will be collected of the sand landfill cover and two samples will be collected of calcium sulfate in areas where the sand cover is not present.

4.16.4 Decontamination

The hand auger and trowels will be decontaminated between sampling points by:

1. Alconox and tap water wash
2. Tap water rinse
3. Isopropanol rinse (A.C.S.)
4. Two distilled water rinses

Decontamination rinses containing isopropanol will be containerized for eventual discharge to the municipal wastewater treatment system.

4.16.5 Quality Control

Field documentation will undergo an internal QC review after the completion of field activities. Original field forms will be reviewed by the SQCO for com-

pleteness, accuracy, and compliance with the FSP and QAPP. Original field forms and photo documentation will be stored on-site until completion of the field program. Upon completion of the field program, all documentation will be relinquished to the Site Manager.

4.16.6 Documentation

Data collected and observations made during wetland soil sampling will be recorded in a field notebook and on the following field documentation forms (Appendix A1):

1. Daily time log
2. Soil data form
3. Photographs of sampling locations

5.0 SAMPLE IDENTIFICATION NUMBERS AND DOCUMENTATION

Sample identification numbers and documentation are described in Section 5.0 of the previously approved Himco Dump RI/FS Field Sampling Plan (Donohue, 1990).

6.0 CHAIN-OF-CUSTODY

Chain-of-custody is described in Section 6.0 of the previously approved Himco Dump RI/FS Field Sampling Plan (Donohue, 1990).

7.0 PACKAGING AND SHIPPING

Packaging and shipping is described in Section 7.0 of the previously approved Himco Dump RI/FS Field Sampling Plan (Donohue, 1990).

A/P/HIMCO/AH3

APPENDIX A1

FIELD DOCUMENTATION FORMS

Well Inventory Form
Donohue & Associates, Inc.

Site: _____ Date: _____
Recorded by: _____ Project No. _____

1. Person Interviewed _____ Telephone No. _____
2. Property Address _____
3. Owner (if different from above) _____ Telephone No. _____
   Address: _____
4. Well information, source: Interview _____ Well Driller _____ Well Log _____ Other _____
   a. Depth to static water level (T.O.P.): _____ Date _____
   b. Height of T.O.P. above ground surface: _____ (use "__" if in a well pit)
   c. Use of well: domestic, commercial/industrial, irrigation, stock, abandoned, monitoring
   d. Problems with yield reported by owner or resident: Yes No
   e. Problems with water quality reported by owner or resident: Yes No
      Circle all that apply: taste, odor, color, sickness, other _____
   f. Samples taken: Yes No
      Sampling Method _____
      Temperature _____ °F °C, pH _____, Conductivity _____ micromhos/cm,
      Odor _____, Color _____,
      Sample taken from tap, storage tank _____, after _____ minutes of running
   g. Driller: _____ Telephone No. _____
      Address: _____
      Wellhead type _____
   h. Type of Well: Dug Drilled Driven Other _____
   i. Date Completed: _____
   j. Total Depth: _____ Pump Depth: _____ Type: _____
   k. Dia. of Surface Casing: ____, Dia. of Inner Casing: ____, Type of Casing: Steel PVC Other _____
   l. Is the well screened? Yes No, Length: _____, Depth: from _____ to _____, Slot Size: _____
      Type: SS PVC Galvanized, Other _____, Gravel Packed: Yes No
   m. Yield in gpm: Rept. _____ Measured _____
      How measured _____
   n. Drawdown _____ ft. after _____ hrs/mins of pumping
   o. Aquifer: _____
5. Remarks, notes

_____

_____

Attach Original Well Log

Donohue

Well Inventory Form
Donohue & Associates, Inc.
(Continued)

6. Location of well on property _____

Location Sketch
Include scale, buildings, well, etc.

Donohue ENGINEERS ARCHITECTS SCIENTISTS

DAILY TIME LOG

Date: ___/___/___

Circle: Sun Mon Tue Wed Thu Fri Sat

Site: _____ Project No.: _____

Weather: _____

Task/Equipment: _____

Firm/Contractor's Personnel: _____ Hrs On–Site: _____

Donohue's Personnel: _____ Hrs On–Site: _____

Site Visitors: _____

Time Log indicating work in progress, remarks:

0600 – 0630 _____

0630 – 0700 _____

0700 – 0730 _____

0730 – 0800 _____

0800 – 0830 _____

0830 – 0900 _____

0900 – 0930 _____

0930 – 1000 _____

1000 – 1030 _____

1030 – 1100 _____

1100 – 1130 _____

1130 – 1200 _____

1200 – 1230 _____

1230 – 1300 _____

1300 – 1330 _____

1330 – 1400 _____

1400 – 1430 _____

1430 – 1500 _____

1500 – 1530 _____

1530 – 1600 _____

1600 – 1630 _____

1630 – 1700 _____

1700 – 1730 _____

1730 – 1800 _____

Items requiring follow–up: _____

Over for Summary

Summary of Daily Activities

Include items such as: boring numbers, footage drilled, well numbers, well construction, wells developed, samples and locations, problems, actions required, stand–by time, etc...

(1)_____
(2)_____
(3)_____
(4)_____
(5)_____
(6)_____
(7)_____
(8)_____
(9)_____
(10)_____

Stand–by time: _____ hrs.
Access delays: _____ hrs.
Actions required: _____

Donohue ENGINEERS ARCHITECTS SCIENTISTS

FISH COLLECTION FORM

SAMPLE LOCATION NUMBER

Site_____ Project No._____

Collectors_____

Date_____

Location Description_____

LOCATION SKETCH

Speciment Number _____
Weight (Kg) _____
Length (mm) _____
Species _____
Time _____
Collection Method_____
Notes _____

Speciment Number _____
Weight (Kg) _____
Length (mm) _____
Species _____
Time _____
Collection Method_____
Notes _____

Speciment Number _____
Weight (Kg) _____
Length (mm) _____
Species _____
Time _____
Collection Method_____
Notes _____

Donohue ENGINEERS ARCHITECTS SCIENTISTS

LEACHATE COLLECTION FORM

SAMPLE LOCATION NUMBER

Site_____ Project_____

Collectors _____
Date_____
Location Description_____
_____
_____
Collection Device _____
Collection Method_____
_____
_____
_____

PHYSICAL DESCRIPTION OF LEACHATE SAMPLE:_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

ANY OTHER CHARACTERISTICS OF NOTE:_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

SHEET____ OF____

Donohue

Engineers & Architects & Scientists

SEDIMENT CORE LOG

BORING NO.

SITE:_____ DATE:_____

BY:_____ PROJECT NO.:_____

SAMPLE DEPTH
____ TO ____

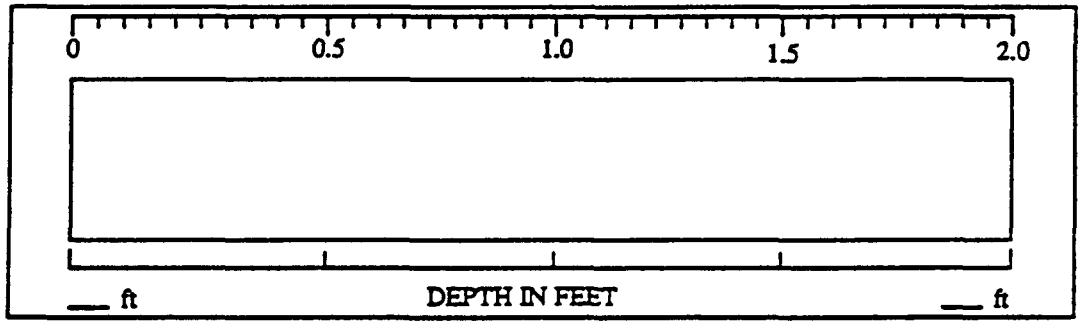
DRILLING METHOD:_____ SAMPLER TYPE:_____ DATE START:_____

CORING FOREMAN:_____ LOG BY:_____ DATE COMPLETE:_____

ASSISTANT:_____ LORAN-C COOR.:_____ LAT. DATE CORE COLLECTED:_____

:_____ LONG. DATE CORE ANALYZED:_____

SEDIMENT CORE SKETCH



SEDIMENT CORE DESCRIPTION:_____

_____

_____

_____

% CORE RECOVERY:_____

NUMBER OF VARVE SEQUENCES/INCH 0.0–0.5' ___ 0.5'–1.0' ___ 1.0'–1.5' ___ 1.5–2.0 ___

ESTIMATED SEDIMENTATION RATE PER YEAR 0.0–0.5' ___ 0.5'–1.0' ___ 1.0'–1.5' ___ 1.5–2.0 ___

SEDIMENTATION RATE = 1 INCH/NO. OF VARVE SEQUENCES

SEDIMENT CORE PHOTOGRAPH

SHEET____ OF____

Donohue **SEDIMENT GRAB DATA FORM** **SAMPLE LOCATION NUMBER**

Engineers & Architects & Scientists Site:_____ Project No.:_____

DATE _____

TIME _____

COLLECTOR _____

_____

Sample No. _____

Water Depth _____

Loran-C Coordinates: _____ Lat. _____ Long.

Sample Equipment: _____

_____

PHYSICAL DESCRIPTION OF SEDIMENT GRAB SAMPLE : _____

Weather: Wind Direction: _____ Cloud Cover: _____

Wind Speed: _____ Precipitation: _____

Temp.: _____ Lake Conitions: _____

ANY OTHER CHARACTERISTICS OF NOTE: _____

SHEET _____ OF _____

Donohue **Surface Water Data Form** **Sample Location Number**

(_____)

Engineers & Architects & Scientists **Site** _____ **Project No.** _____

Date _____ Sample No. _____

Time _____ Water Depth _____

Collector _____ Loran–C Coordinates: _____ Lat.

_____ _____ Long.

	Shallow Sample	Deep Sample
pH:	_____	_____
Dissolved Oxygen:	_____	_____
Temperature:	_____	_____
Conductivity:	_____	_____
Odor:	_____	_____
Clarity:	_____	_____
Comments:	_____	_____

Weather: Wind Direction: _____ Cloud Cover: _____

Wind Speed: _____ Precipitation: _____

Temperature: _____ Lake Conditions: _____

Any other characteristics of note _____

TRENCH LOG FORM

Donahue

CLIENT: _____ SHEET _____ OF _____

PROJECT: _____ EXCAVATOR: _____

PROJECT NO.: _____ LOG BY: _____

DATE: _____ TRENCH NO.: _____

GRID COORD.: START - N_____ E_____ N_____ E_____ TRENCH LENGTH: _____ FT TO _____ FT

END - N_____ E_____ N_____ E_____ TRENCH WIDTH: _____

CONTROL MONUMENT GRID COORD.: N_____ E_____ N_____ E_____

ELEVATION, TOP OF TRENCH:

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT)										DRUM QUANTITY	REMARK NO.
		1	2	3	4	5	6	7	8	9	0		
	5												
	10												
	15												
	20												
	25												

REMARKS: